Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for managing multiple resources in a system including at least one host, network, and a storage space comprised of at least one storage system that each host is capable of accessing over the network, comprising:

after an initial resource configuration has been established and continually during the operation of the system, measuring and monitoring a plurality of service level parameter values indicating a state of the resources in the system;

determining whether the measured service level parameter values satisfy predetermined service level thresholds;

and

determining a corrective modification of ~~one~~ at least one resource deployment or configuration based on the measured service level parameter values when the value for the service level parameter for ~~the~~ that at least one resource does not satisfy the predetermined service level thresholds in order to satisfy the predetermined service level thresholds.

2. (Original) The method of claim 1, wherein the monitored service level parameter comprises one of a performance parameter and an availability level of at least one system resource.

3. (Previously Presented) The method of claim 2, wherein the service level performance parameters that are monitored are members of a set of performance parameters comprising: a downtime during which at least one application is unable to access the storage space; a number of times at least one application host was unable to access the storage space; a throughput in terms

of bytes per second transferred between the at least one host and the storage; and an I/O transaction rate.

4. (Original) The method of claim 1, wherein the modification of resource deployment comprises at least one of adding additional instances of the resource and modifying a configuration of the resource.

5. (Previously Presented) The method of claim 1, wherein a time period is associated with one of the monitored service parameters, further comprising: determining a time during which the value of the service level parameter associated with the time period does not satisfy the predetermined service level threshold; and generating a message indicating that the determined time exceeds the time period when the determined time exceeds the time period associated with the monitored service parameter.

6. (Original) The method of claim 5, wherein a customer contracts with a service provider to provide the system at agreed upon service level parameters, further comprising: transmitting a service message to the service provider after determining that the value of the service level parameter does not satisfy the predetermined service level; and transmitting the message indicating failure of the value of the service level parameter for the time period to both the customer and the service provider.

7. (Original) The method of claim 1, further comprising writing to a log information indicating whether the service level parameter values satisfy the predetermined service thresholds.

8. (Original) The method of claim 1, wherein determining the modification of the at least one resource deployment further comprises: analyzing the resource deployment to determine at least one resource that contributes to the failure of the service level parameter values to satisfy the threshold; determining whether

any additional instances of the determined at least one resource that contributes to the failure of the service level parameter is available; and allocating at least one additional instance of the determined at least one resource to the system.

9. (Original) The method of claim 8, wherein analyzing the resource deployment comprises performing a bottleneck analysis.

10. (Previously Presented) The method of claim 8, further comprising: determining characteristics of access to the resources by applications operating at the service level; and when there are no additional instances of the determined at least one resource, determining whether the access characteristics exceed predetermined access characteristics; and indicating that the service level is not sufficient due to a change in the access characteristics.

11. (Original) The method of claim 10, wherein the access characteristics include read/write ratio, Input/Output (I/O) size, and percentage of access being either sequential or random.

12. (Original) The method of claim 10, wherein the predetermined access characteristics are specified in a service level agreement that indicates the thresholds for the service level parameter values.

13. (Original) The method of claim 1, wherein a plurality of applications at different service levels are accessing the resources in the system, wherein requests from applications using a higher priority service receive higher priority than requests from applications operating at a lower priority service, wherein determining the modification of the at least one resource deployment further comprises: increasing the priority associated with the service level whose service level parameter values fail to satisfy the predetermined service level thresholds.

14. (Previously Presented) The method of claim 13, wherein determining the modification of the at least one resource deployment further comprises: analyzing the resource deployment to determine at least one resource that contributes to the failure of the service level parameter values to satisfy the thresholds; determining whether any additional instances of the determined at least one resource that contributes to the failure of the service level parameter is available; and allocating at least one additional instance of the determined at least one resource to the system, wherein the priority is increased when there are no additional instances of the at least one resource that contributes to the failure.

15. (Previously Presented) The method of claim 1, wherein one service level parameter value indicates a time throughput of Input/Output operations between the at least one host and the storage space has been below a throughput threshold, and wherein determining the modification of one at least one resource deployment or configuration further comprises determining at least one of host adaptor, network, and storage resources to add to the configuration.

16. (Previously Presented) The method of claim 1, further comprising: invoking an operation to implement the determined modification of one at least one resource deployment or configuration.

17. (Previously Presented) The method of claim 1, wherein the service level parameters specify a predetermined redundancy of resources, further comprising: detecting a failure of one component; determining whether the component failure causes the resource deployment to fall below the predetermined redundancy of resources; and indicating whether the component failure causes the resource deployment to fall below the predetermined redundancy threshold.

18. (Currently Amended) A system for managing multiple resources in a system including at least one host, network, and a storage space comprised of at least

one storage system that each host is capable of accessing over the network, comprising:

means, operable after an initial resource configuration has been established and continually during the operation of the system, for measuring and monitoring a plurality of service level parameter values indicating a state of the resources in the system;

means for determining whether the measured service level parameter values satisfy predetermined service level thresholds;

and

means for determining a corrective modification of at least one resource deployment or configuration based on the measured service level parameter values when the value for the service level parameter for ~~the~~ that at least one resource does not satisfy the predetermined service level thresholds in order to satisfy the predetermined service level thresholds.

19. (Previously Presented) The system of claim 18, wherein the service level performance parameters that are monitored are members of a set of performance parameters comprising: a downtime during which the at least one application is unable to access the storage space; a number of times at least one application was unable to access the storage space; a throughput in terms of bytes per second transferred between the at least one application and the storage; and an I/O transaction rate.

20. (Original) The system of claim 18, wherein the modification of resource deployment comprises at least one of adding additional instances of the resource and modifying a configuration of the resource.

21. (Previously Presented) The system of claim 18, wherein a time period is associated with one of the monitored service parameters, further comprising: means for determining a time during which the value of the service level parameter associated with the time period does not satisfy the predetermined

service level threshold; and means for generating a message indicating that the determined time exceeds the time period when the determined time exceeds the time period associated with the monitored service parameter.

22. (Original) The system of claim 18, wherein the means for determining the modification of the at least one resource deployment further performs: analyzing the resource deployment to determine at least one resource that contributes to the failure of the service level parameter values to satisfy the threshold; determining whether any additional instances of the determined at least one resource that contributes to the failure of the service level parameter is available; and allocating at least one additional instance of the determined at least one resource to the system.

23. (Previously Presented) The system of claim 22, further comprising: means for determining characteristics of access to the resources by applications operating at the service level; means for determining whether the access characteristics exceed predetermined access characteristics when there are no additional instances of the determined at least one resource; and means for indicating that the service level is not sufficient due to a change in the access characteristics.

24. (Original) The system of claim 18, wherein a plurality of applications at different service levels are accessing the resources in the system, wherein requests from applications using a higher priority service receive higher priority than requests from applications using a lower priority service, wherein determining the modification of the at least one resource deployment further comprises: increasing the priority associated with the service level whose service level parameter values fail to satisfy the predetermined service level thresholds.

25. (Currently Amended) A system for managing multiple resources in a system including at least one host, network, and a storage space comprised of at least

one storage system that each host is capable of accessing over the network, comprising:

a processing unit;

a computer readable medium accessible to the processing unit;

program code embedded in the computer readable medium executed by the processing unit to perform:

(i) after an initial resource configuration has been established and continually during the operation of the system, measuring and monitoring a plurality of service level parameter values indicating a state of the resources in the system;

(ii) determining whether the measured service level parameter values satisfy predetermined service level thresholds;

and

(iii) determining a corrective modification of at least one resource deployment or configuration based on the measured service level parameter values when the value for the service level parameter for ~~the~~ that at least one resource does not satisfy the predetermined service level thresholds in order to satisfy the predetermined service level thresholds.

26. (Previously Presented) The system of claim 25, wherein the service level performance parameters that are monitored are members of a set of performance parameters comprising: a downtime during which the at least one application is unable to access the storage space; a number of times at least one application was unable to access the storage space; a throughput in terms of bytes per second transferred between the at least one application and the storage; and an I/O transaction rate.

27. (Original) The system of claim 25, wherein the program code for determining the modification of the resource deployment comprises at least one of adding

additional instances of the resource and modifying a configuration of the resource.

28. (Previously Presented) The system of claim 25, wherein a time period is associated with one of the monitored service parameters, wherein the program code is further executed by the processing unit to perform: determining a time during which the value of the service level parameter associated with the time period does not satisfy the predetermined service level threshold; and generating a message indicating that the determined time exceeds the time period when the determined time exceeds the time period associated with the monitored service parameter.

29. (Original) The system of claim 25, wherein the program code for determining the modification of the at least one resource deployment further causes the processing unit to perform: analyzing the resource deployment to determine at least one resource that contributes to the failure of the service level parameter values to satisfy the threshold; determining whether any additional instances of the determined at least one resource that contributes to the failure of the service level parameter is available; and allocating at least one additional instance of the determined at least one resource to the system.

30. (Previously Presented) The system of claim 29, wherein the program code is further executed by the processing unit to perform: determining characteristics of access to the resources by applications operating at the service level; determining whether the access characteristics exceed predetermined access characteristics when there are no additional instances of the determined at least one resource; and indicating that the service level is not sufficient due to a change in the access characteristics.

31. (Original) The system of claim 25, wherein a plurality of applications at different service levels are accessing the resources in the system, wherein requests from

applications using a higher priority service receive higher priority than requests from applications using a lower priority service, wherein the program code for determining the modification of the at least one resource deployment further causes the processing unit to perform: increasing the priority associated with the service level whose service level parameter values fail to satisfy the predetermined service level thresholds.

32. (Currently Amended) An article of manufacture including code for managing multiple resources in a system including at least one host, network, and a storage space comprised of at least one storage system that each host is capable of accessing over the network, wherein the code is capable of causing operations comprising:

after an initial resource configuration has been established and continually during the operation of the system, measuring and monitoring a plurality of service level parameter values indicating a state of the resources in the system;

determining whether the measured service level parameter values satisfy predetermined service level thresholds; and

determining a corrective modification of ~~one~~ at least one resource deployment or configuration based on the measured service level parameter values when the value for the service level parameter for ~~the~~ that at least one resource does not satisfy the predetermined service level thresholds in order to satisfy the predetermined service level thresholds.

33. (Original) The article of manufacture of claim 32, wherein the monitored service level parameter comprises one of a performance parameter and an availability level of at least one system resource.

34. (Original) The article of manufacture of claim 33, wherein the service level performance parameters that are monitored are members of a set of performance parameters comprising: a downtime during which the at least one host is unable to access the storage space; a number of times the at least one

host was unable to access the storage space; a throughput in terms of bytes per second transferred between the at least one host and the storage; and an I/O transaction rate.

35. (Original) The article of manufacture of claim 32, wherein the modification of resource deployment comprises at least one of adding additional instances of the resource and modifying a configuration of the resource.

36. (Previously Presented) The article of manufacture of claim 32, wherein a time period is associated with one of the monitored service parameters, further comprising: determining a time during which the value of the service level parameter associated with the time period does not satisfy the predetermined service level threshold; and generating a message indicating that the determined time exceeds the time period when the determined time exceeds the time period associated with the monitored service parameter.

37. (Original) The article of manufacture of claim 36, wherein a customer contracts with a service provider to provide the system at agreed upon service level parameters, further comprising: transmitting a service message to the service provider after determining that the value of the service level parameter does not satisfy the predetermined service level; and transmitting the message indicating failure of the value of the service level parameter for the time period to both the customer and the service provider.

38. (Original) The article of manufacture of claim 32, further comprising writing to a log information indicating whether the service level parameter values satisfy the predetermined service thresholds.

39. (Original) The article of manufacture of claim 32, wherein determining the modification of the at least one resource deployment further comprises: analyzing the resource deployment to determine at least one resource that contributes to

the failure of the service level parameter values to satisfy the threshold; determining whether any additional instances of the determined at least one resource that contributes to the failure of the service level parameter is available; and allocating at least one additional instance of the determined at least one resource to the system.

40. (Original) The article of manufacture of claim 39, wherein analyzing the resource deployment comprises performing a bottleneck analysis.

41. (Previously Presented) The article of manufacture of claim 39, further comprising: determining characteristics of access to the resources by applications operating at the service level; and when there are no additional instances of the determined at least one resource, determining whether the access characteristics exceed predetermined access characteristics; and indicating that the service level is not sufficient due to a change in the access characteristics.

42. (Original) The article of manufacture of claim 41, wherein the access characteristics include read/write ratio, Input/Output (I/O) size, and a percentage of access being either sequential or random.

43. (Original) The article of manufacture of claim 41, wherein the predetermined access characteristics are specified in a service level agreement that indicates the thresholds for the service level parameter values.

44. (Original) The article of manufacture of claim 32, wherein a plurality of applications at different service levels are accessing the resources in the system, wherein requests from applications using a higher priority service receive higher priority than requests from applications operating at a lower priority service, wherein determining the modification of the at least one resource deployment further comprises: increasing the priority associated with the service level whose

service level parameter values fail to satisfy the predetermined service level thresholds.

45. (Previously Presented) The article of manufacture of claim 44, wherein determining the modification of the at least one resource deployment further comprises: analyzing the resource deployment to determine at least one resource that contributes to the failure of the service level parameter values to satisfy the thresholds; determining whether any additional instances of the determined at least one resource that contributes to the failure of the service level parameter is available; and allocating at least one additional instance of the determined at least one resource to the system, wherein the priority is increased when there are no additional instances of the at least one resource that contributes to the failure.

46. (Previously Presented) The article of manufacture of claim 32, wherein one service level parameter value indicates a time throughput of Input/Output operations between the at least one host and the storage space has been below a throughput threshold, and wherein determining the modification of one at least one resource deployment or configuration further comprises determining at least one of host adaptor, network, and storage resources to add to the configuration.

47. (Previously Presented) The article of manufacture of claim 32, further comprising: invoking an operation to implement the determined modification of one at least one resource deployment or configuration.

48. (Previously Presented) The article of manufacture of claim 32, wherein the service level parameters specify a predetermined redundancy of resources, further comprising: detecting a failure of one component; determining whether the component failure causes the resource deployment to fall below the predetermined redundancy of resources; and indicating whether the component

failure causes the resource deployment to fall below the predetermined redundancy threshold.